

CLAIMS

1. A method of nucleic acid infusion, comprising the following steps (a) and (b):
 - (a) bringing a nucleic acid, a hypertonic solution and cells into contact with each other; and
 - (b) lowering osmotic pressure of the hypertonic solution after the step (a).
2. The method of nucleic acid infusion according to claim 1, wherein the step (b) comprises lowering the osmotic pressure by bringing a hypotonic solution and the cells into contact with each other.
3. The method of nucleic acid infusion according to claim 1 or 2, wherein the nucleic acid is oligonucleotide.
4. The method of nucleic acid infusion according to claim 3, wherein the oligonucleotide is single-stranded oligonucleotide, double-stranded oligonucleotide or an analog thereof.
5. The method of nucleic acid infusion according to claim 3 or 4, wherein the oligonucleotide is deoxyribonucleotide (DNA), ribonucleotide (RNA), phosphorothioate oligodeoxynucleotide, a 2'-O-(2-methoxy)ethyl-modified nucleic acid (2'-MOE-modified nucleic acid), small interfering RNA (siRNA), a locked nucleic acid (LNA), a peptide nucleic acid (PNA) or morpholino antisense oligonucleotide.
6. The method of nucleic acid infusion according to any of claims 1 to 5, wherein the hypertonic

solution comprises at least one substance which is oligosaccharide or polyhydric alcohol.

7. The method of nucleic acid infusion according to claim 6, wherein the oligosaccharide is disaccharide.

8. The method of nucleic acid infusion according to claim 7, wherein the disaccharide is sucrose, maltose or lactose.

9. The method of nucleic acid infusion according to claim 6, wherein the polyhydric alcohol is diol, triol, polyol or sugar alcohol.

10. The method of nucleic acid infusion according to claim 9, wherein the diol is a glycol derivative.

11. The method of nucleic acid infusion according to claim 9, wherein the triol is a glycerol derivative.

12. The method of nucleic acid infusion according to claim 9, wherein the polyol is a polyglycol derivative.

13. The method of nucleic acid infusion according to claim 9, wherein the sugar alcohol is monosaccharide alcohol or oligosaccharide alcohol.

14. The method of nucleic acid infusion according to claim 13, wherein the oligosaccharide alcohol is disaccharide alcohol.

15. The method of nucleic acid infusion according to claim 10, wherein the glycol derivative is ethylene glycol.

16. The method of nucleic acid infusion according

to claim 11, wherein the glycerol derivative is glycerol.

17. The method of nucleic acid infusion according to claim 12, wherein the polyglycol derivative is polyethylene glycol.

18. The method of nucleic acid infusion according to claim 17, wherein the polyethylene glycol has a molecular weight of 2000 or less.

19. The method of nucleic acid infusion according to claim 18, wherein the polyethylene glycol is PEG200, PEG300, PEG400, PEG600, PEG1000, PEG1500, PEG1540 or PEG 2000.

20. The method of nucleic acid infusion according to claim 13, wherein the monosaccharide alcohol is mannitol, sorbitol, xylitol or erythritol.

21. The method of nucleic acid infusion according to claim 14, wherein the disaccharide alcohol is maltitol, lactitol or reduced palatinose.

22. The method of nucleic acid infusion according to claim 6, wherein the hypertonic solution comprises (1) at least one substance which is oligosaccharide or sugar alcohol and (2) at least one substance which is diol, triol or polyol.

23. The method of nucleic acid infusion according to claim 22, wherein the oligosaccharide is disaccharide.

24. The method of nucleic acid infusion according to claim 23, wherein the disaccharide is sucrose,

maltose or lactose.

25. The method of nucleic acid infusion according to claim 22, wherein the sugar alcohol is monosaccharide alcohol or oligosaccharide alcohol.

26. The method of nucleic acid infusion according to claim 25, wherein the oligosaccharide alcohol is disaccharide alcohol.

27. The method of nucleic acid infusion according to claim 25, wherein the monosaccharide alcohol is mannitol, sorbitol, xylitol or erythritol.

28. The method of nucleic acid infusion according to claim 26, wherein the disaccharide alcohol is maltitol, lactitol or reduced palatinose.

29. The method of nucleic acid infusion according to claim 22, wherein the diol is a glycol derivative.

30. The method of nucleic acid infusion according to claim 22, wherein the triol is a glycerol derivative.

31. The method of nucleic acid infusion according to claim 22, wherein the polyol is a polyglycol derivative.

32. The method of nucleic acid infusion according to claim 29, wherein the glycol derivative is ethylene glycol.

33. The method of nucleic acid infusion according to claim 30, wherein the glycerol derivative is glycerol.

34. The method of nucleic acid infusion according

to claim 31, wherein the polyglycol derivative is polyethylene glycol.

35. The method of nucleic acid infusion according to claim 34, wherein the polyethylene glycol has a molecular weight of 2000 or less.

36. The method of nucleic acid infusion according to claim 35, wherein the polyethylene glycol is PEG200, PEG300, PEG400, PEG600, PEG1000, PEG1500, PEG1540 or PEG2000.

37. The method of nucleic acid infusion according to claim 22, wherein the hypertonic solution comprises (1) at least one substance selected from sucrose, mannitol, sorbitol and xylitol and (2) at least one substance selected from PEG200, PEG300, PEG400, PEG600, PEG1000, PEG1500, PEG1540, PEG2000 and glycerol.

38. The method of nucleic acid infusion according to claim 37, wherein the hypertonic solution comprises (1) sucrose, mannitol, sorbitol or xylitol and (2) PEG200, PEG300, PEG400, PEG600, PEG1000, PEG1500, PEG1540, PEG2000 or glycerol.

39. The method of nucleic acid infusion according to claim 6, wherein the hypertonic solution comprises one substance which is oligosaccharide or sugar alcohol.

40. The method of nucleic acid infusion according to claim 39, wherein the oligosaccharide is disaccharide.

41. The method of nucleic acid infusion according

to claim 40, wherein the disaccharide is sucrose, maltose or lactose.

42. The method of nucleic acid infusion according to claim 39, wherein the sugar alcohol is monosaccharide alcohol or oligosaccharide alcohol.

43. The method of nucleic acid infusion according to claim 42, wherein the oligosaccharide alcohol is disaccharide alcohol.

44. The method of nucleic acid infusion according to claim 42, wherein the monosaccharide alcohol is mannitol, sorbitol, xylitol or erythritol.

45. The method of nucleic acid infusion according to claim 43, wherein the disaccharide alcohol is maltitol, lactitol or reduced palatinose.

46. The method of nucleic acid infusion according to claim 39, wherein the hypertonic solution comprises sucrose, mannitol, sorbitol, xylitol or maltitol.

47. The method of nucleic acid infusion according to any of claims 1 to 46, wherein the oligosaccharide and/or the polyhydric alcohol in the hypertonic solution has a total molarity of 0.29 M to 3 M.

48. The method of nucleic acid infusion according to claim 47, wherein the oligosaccharide and/or the polyhydric alcohol in the hypertonic solution has a total molarity of 0.5 M to 2.1 M.

49. The method of nucleic acid infusion according to any of claims 2 to 48, wherein the hypotonic solution has isotonic osmotic pressure or lower.

50. A reagent for nucleic acid infusion, comprising as an ingredient at least one substance which is oligosaccharide or polyhydric alcohol.
51. The reagent for nucleic acid infusion according to claim 50, wherein the reagent is used in a method of nucleic acid infusion according to any of claims 1 to 49.
52. The reagent for nucleic acid infusion according to claim 50 or 51, wherein the oligosaccharide is disaccharide.
53. The reagent for nucleic acid infusion according to claim 52, wherein the disaccharide is sucrose, maltose or lactose.
54. The reagent for nucleic acid infusion according to claim 50 or 51, wherein the polyhydric alcohol is diol, triol, polyol or sugar alcohol.
55. The reagent for nucleic acid infusion according to claim 54, wherein the diol is a glycol derivative.
56. The reagent for nucleic acid infusion according to claim 54, wherein the triol is a glycerol derivative.
57. The reagent for nucleic acid infusion according to claim 54, wherein the polyol is a polyglycol derivative.
58. The reagent for nucleic acid infusion according to claim 54, wherein the sugar alcohol is monosaccharide alcohol or oligosaccharide alcohol.

59. The reagent for nucleic acid infusion according to claim 58, wherein the oligosaccharide alcohol is disaccharide alcohol.
60. The reagent for nucleic acid infusion according to claim 55, wherein the glycol derivative is ethylene glycol.
61. The reagent for nucleic acid infusion according to claim 56, wherein the glycerol derivative is glycerol.
62. The reagent for nucleic acid infusion according to claim 57, wherein the polyglycol derivative is polyethylene glycol.
63. The reagent for nucleic acid infusion according to claim 62, wherein the polyethylene glycol has a molecular weight of 2000 or less.
64. The reagent for nucleic acid infusion according to claim 63, wherein the polyethylene glycol is PEG200, PEG300, PEG400, PEG600, PEG1000, PEG1500, PEG1540 or PEG2000.
65. The reagent for nucleic acid infusion according to claim 58, wherein the monosaccharide alcohol is mannitol, sorbitol, xylitol or erythritol.
66. The reagent for nucleic acid infusion according to claim 59, wherein the disaccharide alcohol is maltitol, lactitol or reduced palatinose.
67. The reagent for nucleic acid infusion according to claim 50 or 51, wherein the reagent comprises as ingredients (1) at least one substance

which is oligosaccharide or sugar alcohol and (2) at least one substance which is diol, triol or polyol.

68. The reagent for nucleic acid infusion according to claim 67, wherein the oligosaccharide is disaccharide.

69. The reagent for nucleic acid infusion according to claim 68, wherein the disaccharide is sucrose, maltose or lactose.

70. The reagent for nucleic acid infusion according to claim 67, wherein the sugar alcohol is monosaccharide alcohol or oligosaccharide alcohol.

71. The reagent for nucleic acid infusion according to claim 70, wherein the oligosaccharide alcohol is disaccharide alcohol.

72. The reagent for nucleic acid infusion according to claim 70, wherein the monosaccharide alcohol is mannitol, sorbitol, xylitol or erythritol.

73. The reagent for nucleic acid infusion according to claim 71, wherein the disaccharide alcohol is maltitol, lactitol or reduced palatinose.

74. The reagent for nucleic acid infusion according to claim 67, wherein the diol is a glycol derivative.

75. The reagent for nucleic acid infusion according to claim 67, wherein the triol is a glycerol derivative.

76. The reagent for nucleic acid infusion according to claim 67, wherein the polyol is a

polyglycol derivative.

77. The reagent for nucleic acid infusion according to claim 74, wherein the glycol derivative is ethylene glycol.

78. The reagent for nucleic acid infusion according to claim 75, wherein the glycerol derivative is glycerol.

79. The reagent for nucleic acid infusion according to claim 76, wherein the polyglycol derivative is polyethylene glycol.

80. The reagent for nucleic acid infusion according to claim 79, wherein the polyethylene glycol has a molecular weight of 2000 or less.

81. The reagent for nucleic acid infusion according to claim 80, wherein the polyethylene glycol is PEG200, PEG300, PEG400, PEG600, PEG1000, PEG1500, PEG1540 or PEG2000.

82. The reagent for nucleic acid infusion according to claim 67, wherein the reagent comprises as ingredients (1) at least one substance selected from sucrose, mannitol, sorbitol and xylitol and (2) at least one substance selected from PEG200, PEG300, PEG400, PEG600, PEG1000, PEG1500, PEG1540, PEG2000 and glycerol.

83. The reagent for nucleic acid infusion according to claim 82, wherein the reagent comprises as ingredients (1) sucrose, mannitol, sorbitol or xylitol and (2) PEG200, PEG300, PEG400, PEG600, PEG1000,

PEG1500, PEG1540, PEG2000 or glycerol.

84. The reagent for nucleic acid infusion according to claim 50 or 51, wherein the reagent comprises as an ingredient at least one substance which is oligosaccharide or sugar alcohol.

85. The method for nucleic acid infusion according to claim 84, wherein the oligosaccharide is disaccharide.

86. The reagent for nucleic acid infusion according to claim 85, wherein the disaccharide is sucrose, maltose or lactose.

87. The reagent for nucleic acid infusion according to claim 84, wherein the sugar alcohol is monosaccharide alcohol or oligosaccharide alcohol.

88. The reagent for nucleic acid infusion according to claim 87, wherein the oligosaccharide alcohol is disaccharide alcohol.

89. The reagent for nucleic acid infusion according to claim 87, wherein the monosaccharide alcohol is mannitol, sorbitol, xylitol or erythritol.

90. The reagent for nucleic acid infusion according to claim 88, wherein the disaccharide alcohol is maltitol, lactitol or reduced palatinose.

91. The reagent for nucleic acid infusion according to claim 84, wherein the reagent comprises as an ingredient sucrose, mannitol, sorbitol, xylitol or maltitol.

92. The reagent for nucleic acid infusion

according to any of claims 50 to 91, wherein the ingredient is in the form of a solid or liquid.

93. The reagent for nucleic acid infusion according to claim 92, wherein the reagent comprises two or more ingredients which are each oligosaccharide or polyhydric alcohol, and the ingredients are each independently in the form of a solid or liquid.

94. The reagent for nucleic acid infusion according to any of claims 50 to 93, wherein the reagent is prepared in advance so that the oligosaccharide and/or the polyhydric alcohol in a hypertonic solution has a total molarity of 0.29 M to 3 M.

95. The reagent for nucleic acid infusion according to claim 94, wherein the reagent is prepared in advance so that the oligosaccharide and/or the polyhydric alcohol in a hypertonic solution has a total molarity of 0.5 M to 2.1 M.

96. A kit for nucleic acid infusion, comprising a reagent according to any of claims 50 to 95.

97. Use of a reagent or a kit according to any of claims 50 to 96 in nucleic acid infusion.

98. A nucleic acid infusion agent, comprising as an ingredient a reagent or a kit according to any of claims 50 to 96.

99. A cell with a nucleic acid infused thereinto by a method of infusion according to any of claims 1 to 49.

100. A macrophage-like cell line RAW264.7 cell, a hybridoma DO11.10 cell, a primary cultured hepatocyte, a primary cultured myoblast, a primary cultured muscle cell, a primary cultured adipocyte precursor cell, a primary cultured adipocyte or a primary cultured neuron with a nucleic acid infused thereinto by a method of infusion according to any of claims 1 to 49.

101. Cell-derived RNA or protein prepared from a cell according to claim 99 or 100.

102. A method of functional analysis of a gene or protein associated with an infused nucleic acid, characterized by using a cell according to claim 99 or 100 or RNA or protein according to claim 101.